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(56) Documents Cited

GB 2261915 A

GB 2244759 A

GB 2052622 A

GB 1392489 A

GB 1270355 A

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US 4658468 A

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## (54) Concealed door closer

(57) A door closer for mounting on a door leaf or frame has a rotatable closer shaft 7 actuatable in a closing direction by a spring arrangement 2, 16. An actuating arm is coupled to an end 6 of the shaft 7 to pivot therewith so that a slide block on the actuating arm is slidably displaceable in a slide bar for mounting in a door frame or leaf (as the case may be). The closer shaft 7 is connected to a rotatable cam 10. An opening piston 9 biased by spring 2 acts on faces of the cam 10 through a roller 11 and a damping piston 13 biased by spring 16 acts on the faces of cam 10 through a roller 12. The faces 31, 32 of the cam 10 are profiled so that the reaction of the spring biased pistons 9, 13 thereon provides the closer with a torque which decreases as the door opens.

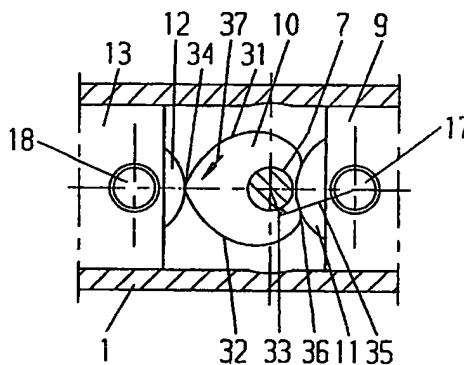


Fig. 4

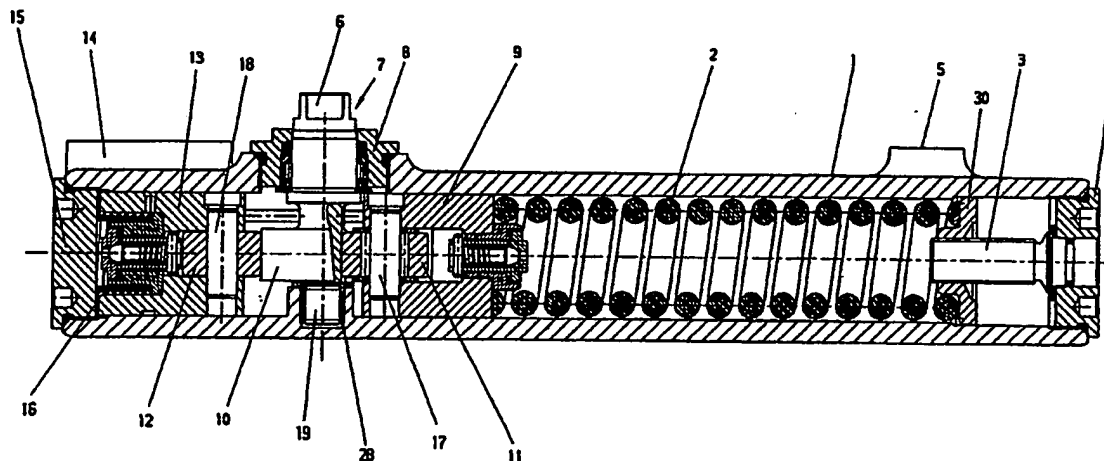


Fig 1

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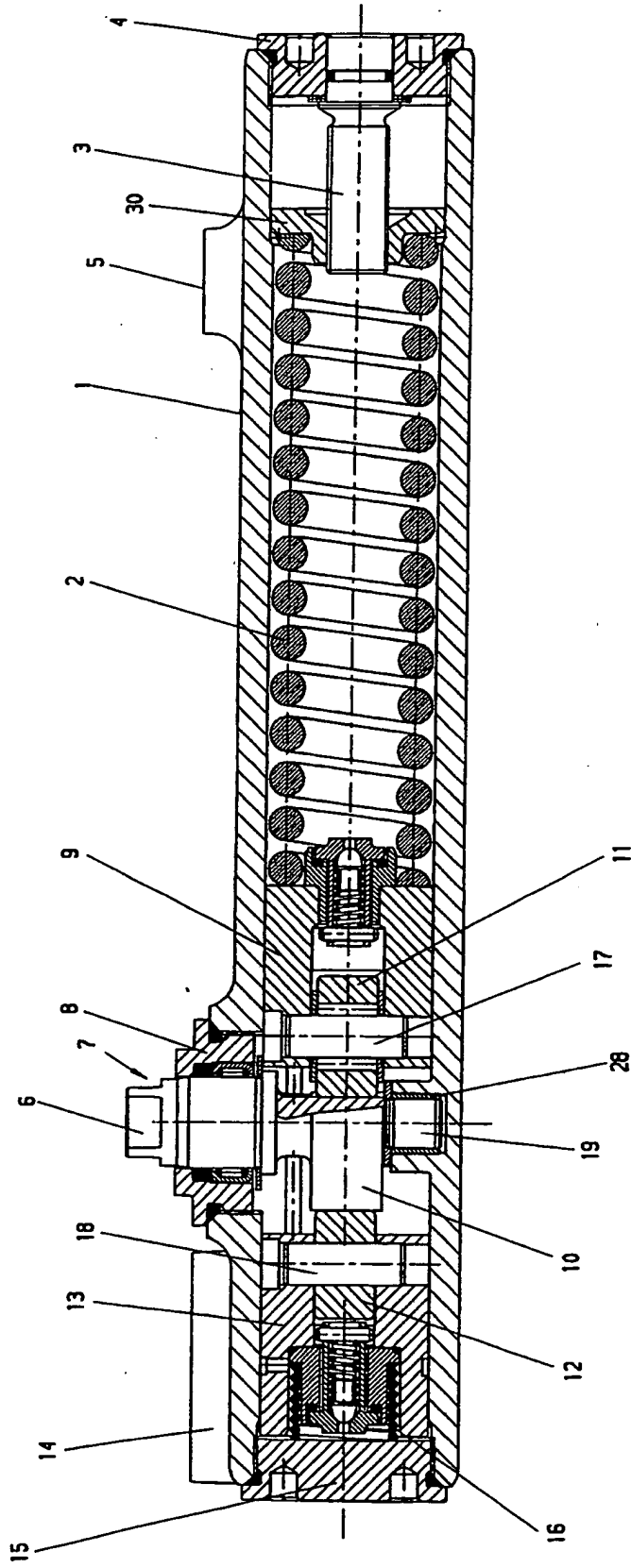


Fig 1

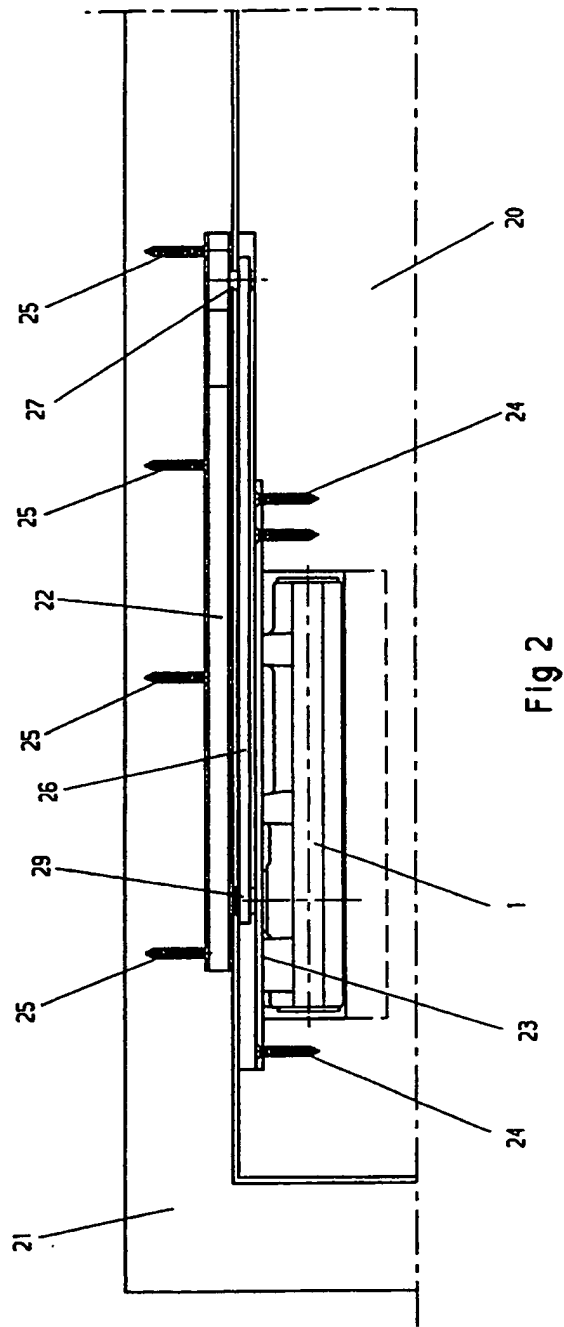


Fig 2

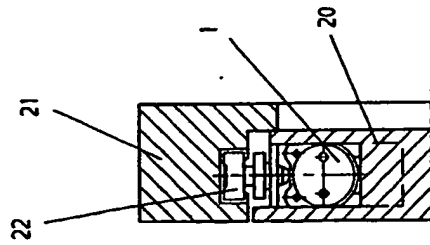


Fig 3

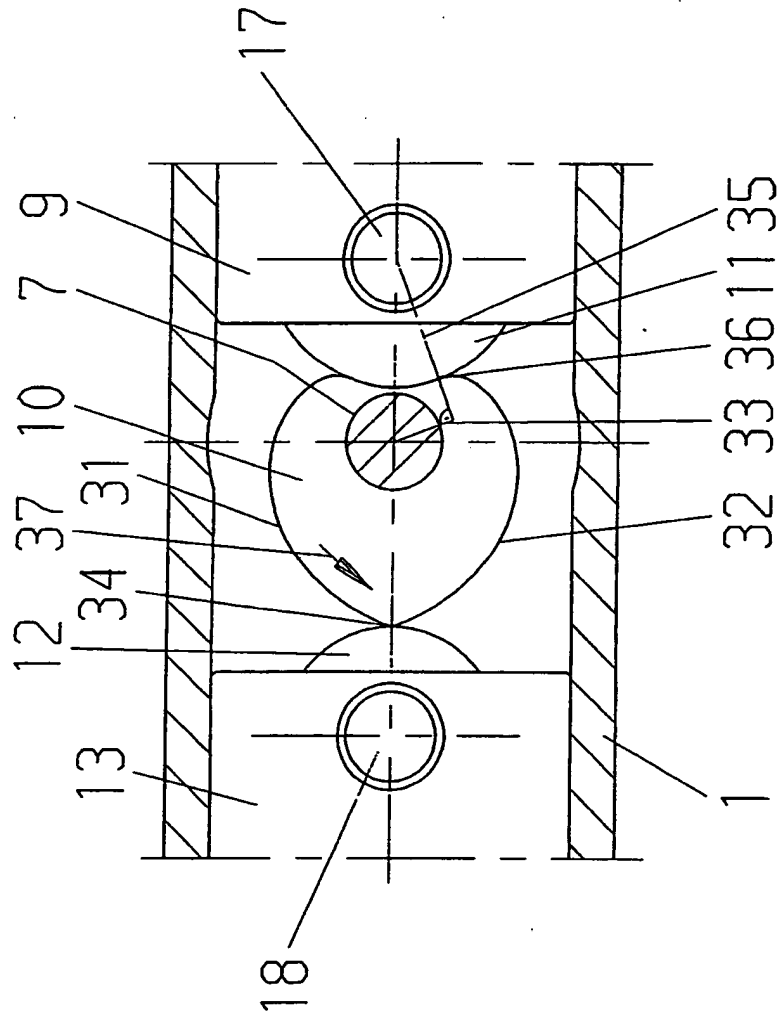


Fig. 4

Title: A door closer having slide bar linkage for concealed mounting in door leaves or door frames

# D e s c r i p t i o n

The invention relates to a door closer for concealed mounting in door leaves or door frames and which also has a slide bar linkage and a slide bar. Actuation of the closer is by means of a closer shaft actuatable in the closing direction by a spring arrangement and of a damping piston operatively connected to such shaft.

A door closer of this kind for mounting in door leaves or door frames is disclosed by a publication of the Lancer company. It relates to a secret closer whose closer shaft has toothing engaging in a rack piston. The great disadvantage of closers of this kind is that since they use a rack, they can be used for only one kind of mounting. Closers of this kind which have a rack piston and associated slide bar are very unpleasant for the user of the door because the co-operation between the slide bar and the piston toothing by way of the mounting arm produces an opening torque which rises too abruptly. The opening torque rises continuously so that the user has to exert a continuously increasing force.

German Offenlegungsschrift 33 45 004 discloses a top door closer which is not intended for concealed

mounting in door leaves or door frames and which is connected to a slide bar. The closer has a closer shaft actuatable in the closing direction by a spring arrangement, a damping piston operatively connected to the shaft and a pivotable actuating arm coupled therewith. The actuating arm is retained in a guide rail by way of a slide block disposed at the other end. To improve ease of operation of a top door closer of this kind which has only one actuating arm and which engages in a guide rail, the closer shaft has a cam whose camming path associated with the opening direction of the door leaf is actuated by a spring thrust member and whose camming path associated with the closing direction of the leaf is actuated by a damping piston.

None of the known door closer systems associated with a slide bar mounting is satisfactory for concealed mounting in door leaves or door frames.

It is therefore the object of the invention to provide a door closer for mounting in door leaves or door frames which can be used by right-hung or left-hung doors in accordance with German Industrial Standards and which has the required ease of operation for the user.

To this end, according to the invention, the closer has a cam so devised that the closer has a decreasing opening torque. To achieve this the pattern of the camming paths comprises various different radii which merge into one another to provide the final camming path pattern. Also, the cam is constructed

symmetrically with its two camming paths so that the door closer can be used for right-hung doors and left-hung doors to German Industrial Standards.

All the known systems use a pinion and toothing, a feature which is extremely disadvantageous for a person walking through such a door because the opening torque to be provided by the user increases continuously. In contrast to the prior art, the invention uses a cam which by virtue of the special construction of the camming paths enables the torque pattern to be so devised that, for example, a relatively high torque is present in the zero position and as the door opens the torque decreases rapidly although the spring force rises linearly.

Because of the construction of the camming path, which is advantageously devised by providing different radii adjacent one another, the closing torque in the zero position can be so increased that the door can readily overcome the resistance of the latch yet does not close fast enough to endanger the user.

In the subdivision of the camming path into various different radii the centre of the discrete radii can be regarded as a line of force since the force always acts perpendicularly to the camming path. For example, the radius in the first part of the camming path can be large and relatively far from the centre of the closer shaft and thus provides a long effective lever arm at the start of the movement. The camming path then changes to the next radius which is, for example, nearer the centre. The lever arm is

therefore of course reduced, the force of the compression spring increasing but the total torque decreasing. There is a quasi-compensation of the spring force.

The invention will be described in greater detail with reference to an embodiment diagrammatically shown in the drawings wherein:

Fig. 1 is a view of a concealed door closer in longitudinal section;

Fig. 2 is a view of a concealed door closer when fitted;

Fig. 3 is a view in section and in side elevation of a concealed door closer when fitted, and

Fig. 4 shows details of the cam.

Fig. 1 is a view in longitudinal section of a concealed door closer with its casing 1. Disposed therein is a closer shaft 7 of which a stub 6 extends out of the casing 1. The other end of the shaft 7 is mounted by means of a mounting 28 which is in the casing 1. A cam 10 is connected non-positively and positively to the shaft 7. The cam 10 has two symmetrically devised camming paths 31, 32. This is necessary so that the closer can be used for right-hung and left-hung doors to German Industrial Standards, to ensure that the same torque and, therefore, the same opening torque is produced in both directions of rotation. A transmission roller 12 and a damping



roller 11 mounted in pivot pins 17, 18 are in contact with the cam 10. The pins 17 are mounted in opening piston 9 which is biased by a compression spring 2. At its other end the spring 2 is retained by a support disc 30. The same is disposed on a spring adjuster 3 adapted to provide stepless adjustment of the spring force of the closer. A closure screw 4 closes the casing at this end.

The pin 18 is disposed in the damping piston 13. The casing 1 is closed at this end by a closure screw 15. Fixings 5, 14 to which a fixing plate 23 is screwed are disposed on the top of the casing 1. The plate 23 is connected by way of screwthreaded elements 24 either to door leaf 20 or to door frame 21. An actuating arm 26 received in a recess in the door 20 is secured to the emerging closer shaft end 6 by way of a closer shaft fixing 29. The other end of the arm 26 is mounted by means of the slide block mounting 27 in the slide bar 22. The same is screwed by way of its fixings 25 to the door frame 21 above the leaf 20. The slide bar 22 is disposed in a recess in the frame 21 so that the closer can be entirely assembled in a concealed manner either in the door frame 21 or in the leaf 20.

Fig. 4 is a view to an enlarged scale of the cam 10. The illustration shows the closer in its basic or zero position 34 - i.e., the door is in the closed state. However, as will also be apparent it is in this position that the lever arm 33 is greatest. When the shaft 7 pivots in the direction 37 - i.e., the door moves out of its closed position - it will be apparent

that the maximum lever arm 33 becomes operative. Such arm is at right-angles to an imaginary line 35 which passes through the centre of the pin 17 and intersects the path 32 at contact point 36. The lever arm 33 is greatest when the door is in its closed position, and so it is in this position that the torque is greatest. As the door continues to open the effect of the different radii of the camming path 31 is to produce a decreasing opening torque since the lever arm 33 shortens. It has been found that because of the construction of the paths 31, 32, which must be symmetrical if they are to be used for right-hung and left-hung doors to German Industrial Standards, any required torque can be produced by means of the different radii of the paths 31, 32. This feature cannot be provided by the prior art secret door closers. Also, specific hydraulic functions of the closer can be controlled by different zones of the cam.

## References

- 1 Casing
- 2 Compression spring
- 3 Spring adjuster
- 4 Closure screw
- 5 Fixing
- 6 Stub of closer shaft
- 7 Closer shaft
- 8 Closer shaft bearing
- 9 Opening piston
- 10 Lifting cam
- 11 Damping roller
- 12 Transmission roller
- 13 Damping piston
- 14 Fixing
- 15 Closure screw
- 16 Compression spring
- 17 Pivot pin
- 18 Pivot pin
- 20 Door leaf
- 21 Door frame
- 22 Slide bar
- 23 Fixing plate
- 24 Fixing
- 25 Fixing
- 26 Actuating arm
- 27 Slide block mounting
- 28 Mounting
- 29 Closer shaft fixing
- 30 Support disc
- 31 Camming path
- 32 Camming path

- 33 Lever arm
- 34 Zero position
- 35 Line
- 36 Contact point
- 37 Direction of movement

C L A I M S

1. A door closer having a sliding bar linkage for concealed mounting in door leaves or door frames, the closer having: a closer shaft actuatable by a spring arrangement in the closing direction; a damping piston operatively connected to the closure shaft; and a pivotable actuating arm coupled at one end to the closer shaft, the actuating arm engaging, by way of a slide block at its other end, in a slide bar let into a door frame or door leaf, characterised in that the closer shaft (7) is non-positively and positively connected to a cam (10) which by virtue of its camming paths (31, 32) is so devised that the closer has a decreasing opening torque.

2. A closer according to claim 1, characterised in that the pattern of the camming paths (31, 32) is combined from the pattern of different contiguous radii relatively to the closer shaft (7).

3. A closer according to claims 1 and 2, characterised in that the cam (10) has two symmetrical cam paths (31, 32).

4. A closer according to claims 1 to 3, characterised in that the cam (10) controls hydraulic functions of the closer.

5. A door closer substantially as herein described with reference to the accompanying illustrative drawings.

6. The combination of a door closer as claimed in any one of the preceding claims and a door leaf or door frame to which the door closer is fitted.

<b>Patents Act 1977</b> <b>Examiner's report to the Comptroller under Section 17</b> <b>(The Search report)</b>		Application number GB 9320896.5
<b>Relevant Technical Fields</b>  (i) UK Cl (Ed.L)      E2M (ii) Int Cl (Ed.5)      E05F (1/08, 1/10, 3/22)		Search Examiner R E HARDY
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<b>A:</b>	Document indicating technological background and/or state of the art.	<b>&amp;:</b>	Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2261915 A	(JEBRON) - Cams 29, 41	Claim 1 at least
X	GB 2244759 A	(JEBRON) - Cams 9, 119	Claim 1 at least
X	GB 2052622 A	(JEBRON) - Cam 17	Claim 1 at least
X	GB 1392489 A	(DORMA) - Cam 18 and page 2 lines 114-118	Claim 1 at least
X	GB 1270355 A	(DORKEN & MANKEL) - Cam 14	Claim 1 at least
X	EP 0212484 A2	(GRETSCH) - Cam 6	Claim 1 at least
X	US 4658468 A	(TILLMAN) - Cam 22 and column 8 lines 60-67	Claim 1 at least

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